Design Status of the Capillary Brine Residual in Containment Water Recovery System

Miriam J. Sargusingh[1], Michael R. Callahan[2]
NASA Johnson Space Center, Houston, TX, 77058

John Garison[3], Benjamin Houng[3]
Jacobs Technology, Houston, TX, 77058

and

Mark M. Weislogel[4]
Portland State University, Portland, OR, 97207

One of the goals of the AES Life Support System (LSS) Project is to achieve 98% water loop closure for long duration human exploration missions beyond low Earth orbit. To meet this objective, the AES LSS Project is developing technologies to recover water from wastewater brine; highly concentrated waste products generated from a primary water recovery system. The state of the art system used aboard the International Space Station (ISS) has the potential to recover up to 85% water from unine wastewater, leaving a significant amounts of water in the waste brine, the recovery of which is critical technology gap that must be filled in order to enable long duration human exploration. Recovering water from the urine wastewater brine is complicated by the concentration of solids as water is removed from the brine, and the concentration of the corrosive, toxic chemicals used to stabilize the urine which fouls and degrades water processing hardware, and poses a hazard to operators and crew. Brine Residual in Containment (BRIC) is focused on solids management through a process of "in-place" drying - the drying of brines within the container used for final disposal. Application of in-place drying has the potential to improve the safety and reliability of the system by reducing the exposure to curew and hardware to the problematic brine residual. Through a collaboration between the NASA Johnson Space Center and Portland Status University, a novel water recovery system was developed that utilizes containment geometry to support passive capillary flow and static phase separation allowing free surface evaporation to take place in a microgravity environment. A notional design for an ISS demonstration system was developed. This paper describes the testing performed to characterize the performance of the system as well as the status of the system level design.

[1] Life Support Systems Engineer, Crew and Thermal Systems Division, 2101 NASA Parkway/EC2.
[2] Water Recovery Engineer, Crew and Thermal Systems Division, 2101 NASA Parkway/EC3.
[3] Mechanical Designer, Jacobs Technology, 2101 NASA Parkway/EC2
[4] Professor, Thermal and Fluid Sciences Group, Room 402m, Engineering Building, 1930 SW 4th Ave.